Synopsis of Research topic

"Effect of Cadmium Chloride On The Physiology of Fresh Water Fish *Cyprinus carpio* From The Godavari River, Nanded, Maharashtra, India"

Submitted To the

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INTRODUCTION

Fishing and aquaculture industry in India is a major industry employing 14.5 million people. India ranks second in aquaculture and third in fisheries production. Fisheries contributes to 1.07 % of total GDP of India. According to the national fisheries development board, the fisheries industry generates and export earnings of of 334.41 billion rupees. Maharashtra state ranks seventh with around 5% share with countries fish production, is it to explore its uncapped potential completely. Historically the Indian freshwater fish farming was based on multi-species system. The first scientifically designed fish farm was constructed by Madras fisheries department in Sunkesula of Krishna district (Now in A.P.) during 1911. Independence in the second half of the 20th century, increasing environmental pollution due to Rapid industrialization and population growth has caused natural resources such as oil and Ponds to become more polluted so that destruction of ecosystem becomes an acute issue. The effluents discharge from the industries into the water bodies contains many toxic compounds like phenols, oils, pesticides, heavy metals, xenobiotics and polyaromatic hydrocarbons. The Fluids effect the physical chemical parameter of water suggest temperature pH dissolved oxygen total solids dissolved solids and suspended solids. These parameters are often employed to assess the water quality.

Considering the above facts and by observing the district wise rural backwardness ranking in Maharashtra for fish production and fisheries development it looks like Nanded district and surrounding area is far more behind than other districts like Nagpur Pune Bhandara Gadchiroli and Gondia in Maharashtra. Nanded is having the enormous potential within the one of the largest reservoirs like Isapur and Arunawati. Due to paucity of work in this area of Maharashtra mainly in Nanded. The study will be helpful to overcome the economical issues faced by the fisherman and also the nutritional shortage of protein per head per year.

2) REVIEW OF LITERATURE

B Austin (1999) studied on the effects of pollution on fish health and observed that the pollutants which entered in the aquatic environment may found in the tissues of Aquatic vertebrate and invertebrate animals. In this case such animals more likely to succumb to disease. Has enormous increased in the human population has forced mankind to increase the food production, for which use of various pesticides in the agricultural field is a must. G.B. Kamble and D.V. Muley studied on the effect of endosulfan and chlorpyriphos on the biochemical composition of the freshwater fish Sarotherodon mosambicus. And they have reported that there have been decline in the levels of glycogen in various organs after exposure to the above pollutants. There is decrease in the levels of proteins and lipids as well due to exposure of sub Lethal concentration. There are some events like floods and rainwater drainage from farms to the fresh water bodies like river and ponds. B. B. Waykar and V. S. Lomte (2001) studied on the acute toxicity of pesticides that is carboryl and endosulfan to freshwater Bivalve Parreysia cylindrica. And they observed that are more sensitive to endosulfan and it is involved in the damage of gills and death of the animal.M Abul Farah et.al. (2002) studied on valuation of of PCP and 24 d by micronucleus test in freshwater fish Channa punctatus. And the observed that the erythrocytes of Channa punctatus where elliptical with a centrally located oblong nucleus. Micronuclei were observed in the treatment groups. Similar studies have been done in this area. Nisar Sheikh and Yeragi S.G. (2004) studies on the effect of rogour 30E (organophosphate) on muscle protein in the freshwater fish and stated that there was decrease in the muscle protein on exposure to increasing sublethal concentration og rogor. David et.al. (2004) work on response of cyprinus carpio to sublethal concentration of cypermethrin. Alteration in protein metabolic profiles and they observed that requirement of all protein fraction was maximum in liver followed by Gill muscle and brain. Protease activity was elevated in all tissues and Ammonia levels were decreased in the tissues except liver.

3) OBJECTIVES OF RESEARCH/PROPOSED HYPOTHESIS

1. To study Toxicity evaluation (LC50) of Cadmium Chloride.

2. To study Effect of Cadmium Chloride on the behaviour of the *Cyprinus Carpio.*
3. To study Effect of Cadmium Chloride on the oxygen consumption of *Cyprinus Carpio*.
4. To study Effect of Cadmium Chloride on biochemical changes in the selected species it is to assess the changes in glycogn, proteins and lipids.
5. To study Histopathological alteration due to the Cadmium Chloride on the tissues of intestine, gills, liver and Kidney.
6. Publication of output of research work to common population.

4) Study Area

- The research work is carried out in River Godavari near by Krushnoor Industrial Area.
- The research region is denoted with specifie spots know as spot A, B.
- Spot A is prior to the Krushnoor region.
- Spot B is near by Krushnoor Industrial area.

5) METHODOLOGY TO BE ADOPTED

A) Project area - The study finalised for present investigation will be in the area of fresh water Godavari river Krushnoor Industrial Outlet.

B) Methodology -

1) Collection of data from different sources.
2) Data will be collected through questionnaire survey as well as experimental work.
3) Methodology of wastewater analysis by R K Trivedi.
4) IAAB (Indian Association of Aquatic biology) by M S Kodarkar.
5) APHA (American Public Health Association)
6) Statistical analysis as like ANOVA, student t-test, mean, mode and median, regression equation, correlation coefficient.

6) IMPORTANCE OF THE STUDY INTERNATIONAL STATUS

Ribeiorro et.al. (2005) studied on bioaccumulation and the effects of organochlorine pesticides, PAH and heavy metals in the eel at the the Camgue nature reserve, France High concentrations of contaminants were found in eel tissues. La Capeliere had the greatest OC and PAH concentrations; unexpected lesions in gills, livers and spleens were more common at the other sites. Liver and spleen tumors and lipidosis in livers were associated with chronic, and gill lesions

with acute exposure.High pesticide and PAH concentrations and lesions in eels from the Camargue reserve demonstrate the contamination of the area. A more complete study in the Camargue reserve is necessary to better understand the impact on wildlife and humans. Also,this study suggests that eel biology must be better understood before continued use of this species as a biomonitor of polluted areas.

A Adeyeye and P B Ayoola (2013) studied on the effects of some heavy metal concentrations in some organs of African catfish (Clarias gareipinus) from Eko Ende dam ,Ikirun, Nigeria. They have observed that the highest metal concentrations where in the liver and in the gills. While the lowest concentrations was in the kidney. The general decreasing order of metal accumulation in the organs was Fe>Zn>Cu>Mn>Cd and Arsenic was among the lowest.

Vromsia et.al. (2014) studied on the acute toxicity of monocalm 400sl (monocrotophos) and profenalm 720ec (profenofos) on Oreochromis nilotics (Lineeus 1788) and observe that there is slower percula moments loss of balance, increased surfacing activities, loss of pigmentation, increased aggression and erratic swimming. In recent years there has been a special increasing interest in heavy metal contamination and toxicity in aquatic biomes.

Montazer Mensoor and Ali Said (2018) studied on determination of heavy metals in freshwater fishes of the tigris river in Baghdad. And they a reported that there has been increasing amount of heavy metals in the tissues of fishes which were main food sources in that area. And accumulation was over the acceptable levels for conception to humans. Cadmium and chromium where way more highest than other metals. Along with heavy metals as mentioned in the introduction of pesticides are also the site of concern in the position of fresh water bodies and which affecting the freshwater fishes.

NATIONAL STATUS -

The increasing industrialisation and urbanisation and development consequent pollution of water has brought a measurable freshwater crisis in India.

T. S Pathan et.al. (2010) Studied histopathological changes in the gills freshwater fish, Rasbora daniconius exposed to paper mill effluents. They observed that there is extensive damage to the gills of fish exposed to the effluents. The changes like

bulging tip of primary level Iamellae, epithelial hypertrophy. Fusion curling and reduction of secondary gill lamellae. Swelling in pillar, mucous and chloride cells. Their nuclei appear swollen and pyknotic. Similarly, Thenmozhi et.al. (2011) studied impacts of malathion on mortality and biochemical changes of freshwater fish Labeo rohita, and then they reported that there is gradual decrease in nucleic acids proteins free amino acids and glycogen. During the recovery period the levels of biochemical components progressively increased indicating a probable recovery from the destruction of internal organs. And the pesticides intoxication has made defective consequence in the normal metabolic pathways which led increasing the rate of mortality in fish population. Ganeshwade R M (2012) studied effect of dimetheoate on the level of cholesterol in freshwater fish Punctuas ticto and after observing 96 hours and 60 days the cholesterol content was recorded and observed from different tissues after exposure period. Acute exposure results show that cholesterol level was increased in kidney and decreased in ovary, testis, liver,gills, muscles and brain.

Ram Nayan Singh (2012) studied on histopathological alterations in the kidney of Cyprinus carpio. After exposure to dimetheoate (EC 30%) and the have observed that there are certain histological alterations in the kidney at the level of glomerulus and tubular epithelium in fish after exposure to toxic agents such as pesticides have been reported by many workers. K. Muthukumaravel et.al. (2013) studied on the acute toxicity of pesticides on the freshwater fish Labeo rohita and they have reported that there is change in body colour some behavioral changes such as a regular swimming moments, loss of equilibrium, restlessness, and excess loss of mucus and undergone chemical stress. Similarly Neelima et.al. (2016) studied on Oxygen consumption in freshwater fish cyprinus carpio exposed to Lethal and sub Lethal concentration of cypermethrin and they reported that cypermethrin is highly toxic and has a profound impact on respiration in cyprinus carpio in both lethal and sub Lethal concentrations there is very ation in the oxygen consumption of fish was probably due to impaired oxidative metabolism and pesticides induced stress. There is changes in structures of gills physiology which could alter the diffusing capacity of gills.

SIGNIFICANCE OF THE STUDY

It is unfortunate that there is no water body, which does not have finger prints of human beings. Every water body receives the effluents containing heavy metals either from point or from nonpoint sources. Worst thing about heavy metals is their persistence in environment due to their unbiodegradable nature. It is the reason that aquatic fauna particularly fish bioaccumulate them, and thus, they remain in the tissues of the fish for long time. Fishes are the important source of protein and PUFA; therefore, American Heart Association (AHA) recommended fish twice a week to the human adults. Unfortunately, fishes are now becoming the major source of heavy metals due to the pollution caused by industries. According to United States Environmental Protection Agency (USEPA) , these metals generally cause two types of health effects. One is carcinogenic and other is non-carcinogenic effects.

After bioaccumulation of heavy metals and pesticides in the fish, there is certain effects of the pollutants on fish health as well as on the proteins and lipids content in the fish. Mainly after loss of glycogen from the muscles, it is obvious that the mass of muscles get decreased and that will affect on the protein which we are dependent on the fish. Therefore the nutritional value of the fish gets lower and lower. The study will help by which ways we can overcome these problems.

PROPOSED WORK PLAN/FORMULATION AND STRUCTURE OF STUDY YEAR WISE PLAN OF WORK AND TARGETS TO BE ACHIEVED:

First year

1) Collection of references.

2) Review of literature.

Second Year

1) Detection of pollutants from the river of selected study area.

2) Toxicity evaluation of determined toxicants.

3) Behavioral study.

Third year

1) Study on histopathological changes on different tissues of selected fish.

2) Biochemical analysis.

3) Completion of writing and submission of thesis.

REFERNCES

Adeyeye and Ayoola (2013) studied on the heavy metal concentrations in some organs of African catfish (Clarias gariepinus) from Eko-Ende Dam,Ikirun, Nigeria, J Applied Sciences 8(1):43-48.

Austin (1999) studied on the effects of pollution on fish health, Journal of Applied Microbiology Symposium Supplement 1999, 85, 2345-2425.

Bhalchandra B Waykar and V S Lomte (2001) on Acute toxicity of pesticides carboryl and endosulfan to freshwater bivalve Parreysia cylindrica, Pol Res.20(1):25-29 (2001).

David et.al. (2004) studied on response of cyprinus carpio to sublethal concentration of cypermethrin : alterations in protein metabolic profiles, Chromosphere 56 (2004) 347-352. Farah et.al. (2002) studied on evaluation of PCP and 2,4-D by micronucleus test in freshwater fish Channa punctatus, Ecotoxivology and Environmental safety 54 (2003) 25-29. Ganeshwade R M (2012) studied on effects of dimetheoate on the level of cholesterol in freshwater fish Punctatus ticto.

Kamble and Muley studied on acute exposure of endosulfan and chlorpyriphos on the biochemical composition of the freshwater fish Sarotherodon

mosambicus, Indian Journal of Environmental Sciences 4(1) pp. 97-102 (2000).

Montazer Mensoor and Ali Said (2018) on determination of heavy metals in freshwater fishes of the tigris river in Baghdad, Fishes 2018, 3, 23; doi:10.3390/Fishes3020023.

Pathan et.al. (2010) studied on histopathological changes in the gills of freshwater fish, Rasbora daniconius exposed to paper mill effluents, Iranica Journal of Energy & environment 1(3) : 170-175, 2010 ISSN 2079-2115.

Neelima et.al. (2016) studied on Oxygen consumption in freshwater fish cyprinus carpio exposed to lethal and sublethal concentrations cypermethrin, Int. J. Curr. Microbiol. App. Sci (2016) 5 (4) : 338-346.

Ribeiorro et.al (2005) studied on bioaccumulation and the effects of organochlorine pesticides, PAH and heavy metals in the eel at the Camgue nature reserve, Aquatic toxicology 74(2005) 53-69.

Thenmozhi et.al (2011) studied impacts of malathion on mortality and biochemical changes of freshwater fish Labeo rohita.

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